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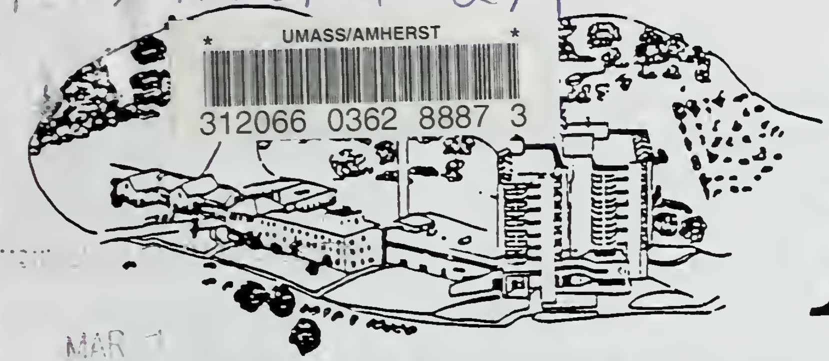

ILLUSTRATION: The 8 story State Laboratory Institute (1974) replaced the Bussey Institute building, site of the earliest antitoxin and vaccine production activities (1894) and diagnostic services (1895). Theobald Smith, the great American microbiologist, was the first Director of the Antitoxin and Vaccine Laboratory (1895-1914). The remaining structures (from left) are the Bussey stables and the Biologic Laboratories.

LAB & EPI NEWS

MASSACHUSETTS STATE LABORATORY INSTITUTE
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RABIES: A HISTORICAL OVERVIEW

SUBMITTED BY THE VIROLOGY LABORATORY

Rabies is one of the oldest and most feared of all human diseases. Violent symptoms followed by death are virtually inevitable. Rabies remains an incurable disease; only three unvaccinated people are known to have survived the infection.

HISTORY

Rabies has plagued man since ancient times. One of the earliest references to rabies was recorded before 2200 B.C. It established a fine for the owner of any mad dog that bit a person and caused his death.

The great French microbiologist, Louis Pasteur, began research on rabies in 1880. Two years later, he was able to transmit rabies experimentally to an animal by intracerebral inoculation. In 1884, he surmised that dogs could be protected by vaccination with his experimental rabies preparations. In 1885, Pasteur immunized a 9 year old boy named Joe Meister who had been severely bitten by a rabid dog. Joseph Meister survived. This was a milestone in modern medicine.

Diagnostic testing for rabies has helped transform the outcome of the disease. Perhaps more than any other disease, rabies has stimulated investigators to attempt development of rapid and accurate diagnostic methods. In 1903, a detection method for the disease was discovered when identifiable inclusion bodies were found in the brain of a rabid animal by the Italian physician, Adelchi Negri. However, testing for Negri bodies was unreliable, as only 15-20% of those afflicted with the disease developed inclusion bodies, and false positives also occurred.

The discovery of Negri bodies was followed by the development of vaccines and more reliable testing methods. The Mouse Inoculation Test (MIT), a test where mice were inoculated intracerebrally and observed until rabies developed, took up to 30 days. Today, rabies is diagnosed by the Fluorescent Rabies Antibody (FRA) test which is nearly 100% accurate. Results can be available within 4-6 hours.

A safe and reliable human cell vaccine for rabies is now available. The Human Diploid Cell Vaccine (HDCV) is used in conjunction with the Human Rabies Immune Globulin (Human RIG). Five doses of HDCV is administered in the arm along with one dose of Human RIG which is given at the wound site.

THE DISEASE

The rabies virus belongs to the family Rhabdoviridae, genus Lyssavirus. It causes an infectious encephalomyelitis that is pathogenic in all warm blooded mammals.

The virus is transmitted by the saliva of an infected animal. It multiplies at the infected wound site in muscle cells for several days and then travels towards the central nervous system (CNS) via the peripheral nerves. The virus multiplies further in the CNS and spreads by the nerve pathways to the salivary glands. The glands become infected at the time of or shortly after the appearance of clinical signs. The earliest that a dog or cat has been demonstrated to shed the virus prior to the onset of clinical signs is 6 days, hence the 10 day quarantine for dogs and cats after a biting episode. The salivary glands do not always become infected. The infection rate of these glands can be as high as 70% in foxes or as low as 15% in cats.

Humans are naturally resistant to rabies. In fact, the risk of developing rabies is estimated at 15% after a bite by a rabid dog to 80% in a severe attack by rabid wolves. Washing the wound thoroughly can reduce the risk to less than 1%. The incubation period is 3-8 weeks but can vary from as little as 9 days to as long as 12 months in rare cases. It is seldom seen in rodents or opossum in the U.S and the common myth that rats carry rabies is untrue.

Rabies is preventable only if treated before clinical manifestations appear. Once signs of rabies develop it is virtually 100% fatal, and death usually occurs within 6 days. Prophylaxis for rabies is unique because immunization is commonly administered after exposure has occurred. This is possible because the incubation period is sufficiently long to allow active antibody production following administration of the vaccine.

(continued on p. 3, Rabies: Overview)

NATIONAL LABORATORY TRAINING NETWORK NEW ENGLAND ALTA

SUBMITTED BY
THE AREA RESOURCE OFFICE

In September, an Area Resource Office, one of seven nationwide, opened at the Massachusetts Department of Public Health, State Laboratory Institute in Jamaica Plain. Massachusetts was awarded a grant for the New England Area Laboratory Training Alliance (ALTA) of the National Laboratory Training Network (NLTN), a laboratory training delivery system administered by the Association of State and Territorial Public Health Laboratory Directors and supported by the Centers for Disease Control. The primary goal of the NLTN is to establish training coalitions that assess training needs and to develop, deliver and evaluate training activities.

The Area Resource Office Director, Marcia Stowell, invites inquiries. Please call (617) 522-3700 X153.

RABIES: SURVEILLANCE AND PREVENTION ACTIVITIES

SUBMITTED BY
THE EPIDEMIOLOGY PROGRAM

The State Laboratory Institute and the Epidemiology Program of the Massachusetts Department of Public Health have been working closely to coordinate rabies prevention and surveillance activities. All diagnostic tests for rabies in wild and domestic animals is performed at the State Laboratory Institute's Rabies Laboratory. Results of such testing are used by medical providers when deciding about post-exposure prophylaxis. Laboratory statistics are also used as an epidemiologic tool for treatment decisions when an animal is not available for testing. Data from rabies testing performed in neighboring states is also collected to assess the possibilities of disease importations.

A testing policy developed in the Spring of 1988 requires that veterinarians, physicians, animal control officers or boards of health contact the Epidemiology Program (617-522-3700, x420) to discuss any requests for rabies testing. Many requests involve low-risk animals or situations that do not carry a risk of rabies. Therefore, testing is not always necessary. In the first year of this policy, testing has been reduced from approximately 800 to 250 tests/year. This decrease has allowed the Laboratory and the Epidemiology Program to initiate discussions with animal control and wildlife officials regarding surveillance testing of high-risk animals. Copies of the policy are available from the Epidemiology Program.

Using the lab data, the Epidemiology Program will provide advice about the need for post-exposure prophylaxis. The Program is currently surveying veterinarians and animal control officers (high-risk occupations in Massachusetts) about the prevalence of pre-exposure prophylaxis and barriers to it. Vaccine sales data will be

(continued on p.3, Rabies: Surveillance)

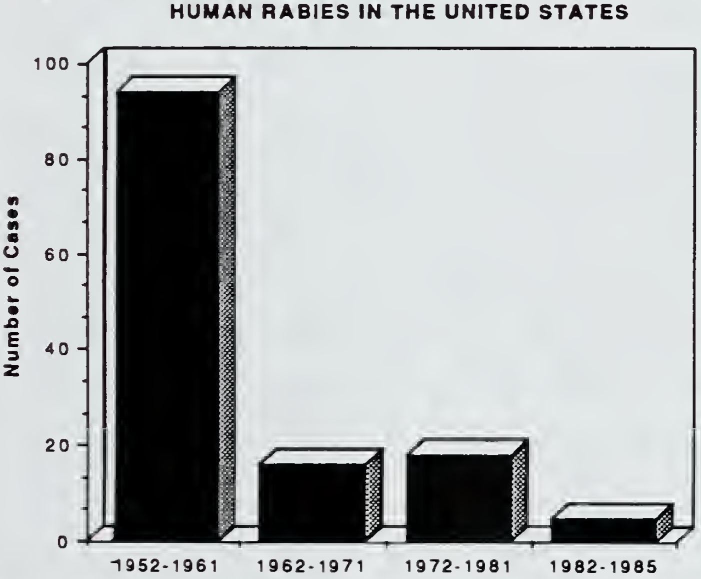
(Rabies: Surveillance, continued from p. 2)

used to identify, for subsequent investigation, instances of post-exposure prophylaxis. This may help measure the extent of high-risk bite incidents and how appropriately the vaccine is being used. Finally, the laws and regulations regarding rabies are being reviewed to see if updating is necessary.

(Rabies: Overview, continued from p. 2)

ANIMAL RABIES

The principle vector of rabies in the past was the dog. Today the high-risk rabies animals include skunks, raccoons, bats, and foxes. Transmission by dogs was virtually eliminated by 1965 through extensive vaccination programs. Rabies cases in dogs in the United States has declined from 6,949 in 1947, 412 in 1965, to 94 in 1986. Rabies cases in cats surpassed cases in dogs in 1981 and continues to do so. Human rabies has also drastically declined since 1952 in the United States.



IN MASSACHUSETTS

Massachusetts has had its share of rabies. Since 1920 over 30,000 animals have been tested for rabies at the State Laboratory Institute. Between the years of 1920 and 1930, seven out of every ten specimens were positive. During that period there were almost 3,000 cases of animal rabies, 95% of which were dogs. Foxes, bats, and skunks were rarely tested, although these animals are the three major vectors of rabies in the U.S. today. Since 1917, sixteen people in Massachusetts have been diagnosed as having died from rabies .

In 1954, the first insectivorous bat was found positive for rabies in the United States. In 1964, Massachusetts became the 35th state in the U.S. to find rabies in its bat population. Although only three cases of rabies in native terrestrial animals have been identified since 1950 (a skunk in '75, a cat in '80, a fox in '81), rabies is endemic in our bat population and the possible spillover from bats to the terrestrial animal population is always a threat.

THE RABIES LABORATORY

The Rabies Laboratory at the State Laboratory Institute, tests a variety of animals every year, including bats, raccoons, skunks, foxes, dogs, cats and a few miscellaneous "other" animals. Of the animals tested since 1981, bats have been positive for rabies exclusively. Over the past five years, an average of 8 bats tested positive for rabies per year. In 1988 and 1989, the actual numbers were 5 and 4, respectively.

The number of rabies specimens submitted to the rabies laboratory declined in 1989 because of a new testing policy (see Rabies: Surveillance and Prevention Activities, p. 2) initiated by the Epidemiology Program. This policy screens all requests for testing and eliminates low-risk animals and situations that do not warrant animal testing. Rabies, although not a thing of the past, has been successfully prevented in Massachusetts.

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Excellent opportunities for Chemists to be part of a project investigating Molluscan Shellfish for Certain Marine Toxins.

Chemists (2) - One full-time for 16 months/one part-time for 12 months. Duties will include method development, sample analysis using quantitative HPLC and data reporting. Knowledge of HPLC and computers required.

BIOLOGIC LABORATORY

Assistant Director- Head of Bacterial Vaccine Division. The candidate will be responsible for the management of production for currently licensed vaccines and for directing research programs. Must have a Ph.D. or M.D. and a minimum of 5 yrs. post-doctoral experience related to pharmaceutical production and vaccine research and development.

Contact: Ms. Julie Schmitt
Personnel Director
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